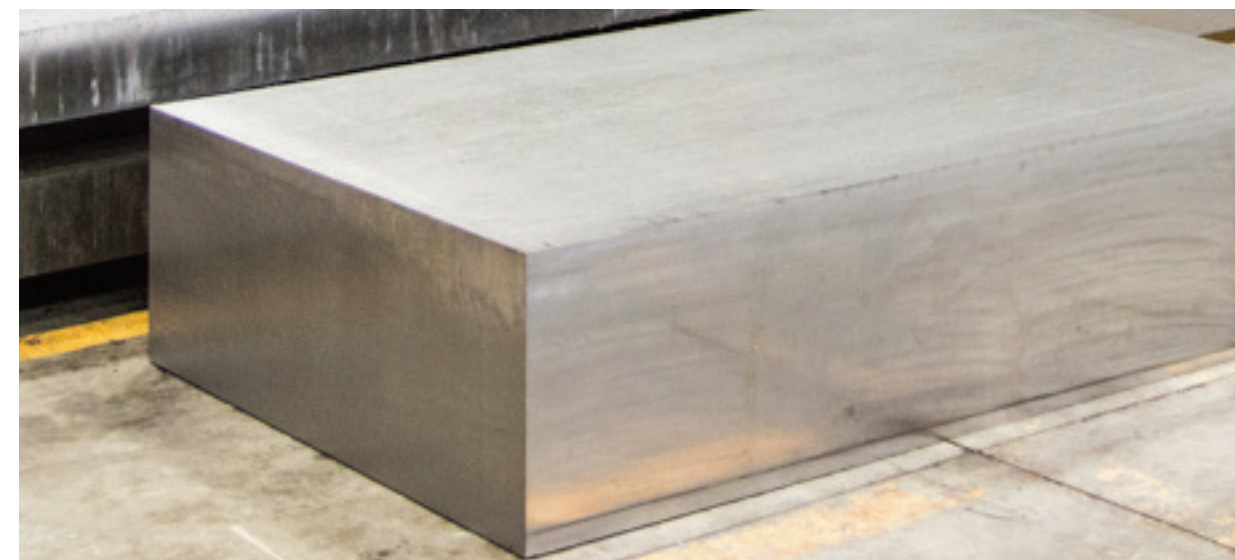




CAPABILITIES

Ellwood Specialty Steel is a fully integrated producer of a wide range of specialty tool steels. Our ExELL grades are made with the advanced ASEA-SKF steel making capabilities which include an ultra high powered electric arc furnace with subsequent state of the art ladle refining and vacuum degassing equipment for the most complete and modern ladle metallurgy technology.

Our steel making expertise and capability is further enhanced from a long forging history with optimum forging and heat treating practices to develop very special material characteristics of product uniformity, cleanliness, machinability, polishability, strength, toughness, hardenability and other steel properties. All this from production facilities certified to ISO 9002.



QUALITY ASSURANCE

Ellwood Specialty Steel is committed to providing products and services which will consistently meet or exceed all quality and performance expectations. We will provide customer and technical service that will ensure complete satisfaction

Being a very flexible provider, Ellwood Specialty

Steel will establish product programs to fully support industry or customer requirements. Our extensive stock programs are supported by very short mill lead times of custom forged products. Customized stock programs are and can be available for specific customer needs.

This information is intended to provide general data on our products and their uses and is based on our knowledge at the time of publication. No information should be construed as a guarantee of specific properties of the products described or suitability for a particular application. Ellwood Specialty steel reserves the right to make changes in practices which may render some information outdated or obsolete. Ellwood Specialty Steel should be consulted for current information and/or capabilities.

ELLWOOD SPECIALTY STEEL

Your tool and mold steel specialist

499 Honeybee Lane 800-932-2188
New Castle, PA 16105 724-654-9550 FAX



ExELL 420-SMDQ is a premium grade stainless steel used in many tooling applications with these typical properties

- Good corrosion resistance
- Very good polishability
- Excellent steel cleanliness
- High working hardness/strength
- Good wear resistance
- Very good stability in hardening

TYPICAL ANALYSIS

C	0.38	Mn	0.45
Si	0.75	Cr	13.75
V	0.30		

APPLICATIONS

ExELL 420-SMDQ is used in various applications and is especially recommended for most types of molding tools where the unique properties of ExELL 420-SMDQ are required.

Very good surface finish: When polishability requires an excellent surface for release, minimal stress raisers, the molding production of most optical parts of the molding of medical and the food industry parts such as containers.

Corrosion resistance. For extruding or molding corrosive materials such as PVC and acetates and for molds or engineering parts subjected to mild corrosives or to humid working or storage conditions.

Good wear resistance. Very suitable for certain adhesive or abrasive wear resistance requirements. For molding abrasive filled plastics and for long or high production runs.





IMPROVED MANUFACTURING AND RELATED PERFORMANCE

ExELL 420-SMDQ is manufactured with special melting, refining, forging and thermal treatment to produce **Super Mold & Die Quality** for applications demanding more optimum steel properties such as material cleanliness, structure uniformity, strength, toughness and polishability.

- Primary steel melting in advanced state-of-the-art ASEA-SKF ladle metallurgy and vacuum degassing equipment.
- Special refining and melting treatments
- Heavy forging reductions and homogenizing
- Complete manufacturing, production, testing and quality assurance within facilities certified to ISO 9002

APPLICATIONS

USE	Typical Hardness HRC
Engineering Part	50-54
Injection Molds	50-54
Extrusion or Pultrusion Dies	46-54
Compression or Transfer Molds	50-54
Blow Molds for PET or PVC	46-54

Note: Most applications of ExELL 420-SMDQ utilize the optimum combination of corrosion resistance, hardness and toughness properties attained by heat treatment with hardening at 1870F and double tempering at 480F.

CHARACTERISTICS

Physical Properties:

Coefficient of Thermal Expansion, in/in/F

70-400 F.....0.0000060

70-600 F.....0.0000064

Thermal Conductivity, BTU in/ft² hr F

70 F.....160

400 F.....168

750 F.....175

Density, lbs/cu.in

70 F.....0.2833

400 F.....0.280

750 F.....0.276

Modulus of Elasticity, psi

70 F.....29,200,000

400 F.....28,000,000

750 F.....26,500,000

Specific Heat, Btu/lbF

70 F.....0.115

Critical Temperatures

Ac₁ - 1470F

Ac₁ - 1580F

Ms - 325F

HEAT TREATMENT (General Recommendations)

STRESS RELIEVING

After rough machining of an annealed component, heat the part to 1200F, equalize and hold 1-2 hours. Furnace cool to 900F and then air cool to room temperature.

ANNEALING

With a protective atmosphere or vacuum furnace, heat slowly to 1450F. Equalize and hold one hour per inch of thickness. Furnace cool 20F/hr to 1200F and equalize. Air cool to room temperature. Hardness - 229 HB max.

HARDENING AND QUENCHING

Protect against decarburization and oxidation during austenitizing.

Preheating : Heat to 1200F and equalize. continue heating to 1550F and equalize. Complete heating to hardening temperature.

Hardening: Typical austenitizing range is 1870-1920F. Hardening temperature can be adjusted to develop maximum hardness. A hardening temperature of 1870-1880F is normally used for most applications while 1910-1920F can be used for maximum hardness.

Hardening Temperature	Hold Time*	As-Quenched Hardness
1870F	30 min.*	56 ± 2 HRC
1910F	30 min.	57 ± 2 HRC

*Hold time = time at temperature after tool is fully heated through

Quenching: should be performed as rapidly as possible without promoting excessive movement or cracking.

Typical quenching media include:

- High speed gas with sufficient positive pressure in vacuum furnace
- Circulating air/atmosphere
- Excellent steel cleanliness
- Martempering bath or fluidized bed at 480-1020F, then air cool at room temp.
- Warm oil

TEMPERING

Temper immediately after quenching to about 150F. Temper a minimum of two times with intermediate cooling to room temperature

Choose the tempering temperature to develop required hardness. **(However, tempering at 480F is recommended for the optimum balance of hardness, toughness, corrosion resistance and dimensional stability.)** ExELL 420-SMDQ should be heated to the desired tempering temperature and held a minimum of two hours. Air cool to room temperature. Check hardness and adjust temperature for additional tempering operation(s). Repeat for added tempers.

Typical tempering temperature responses follow (use for approximate guideline only):

Tempering Temperature	Harden 1780F HRC	Harden 1910F HRC
480F	52	53
570F	52	53
750F	51	52
930F	52	54
1020F	46	47
1110F	40	40

*Avoid tempering between 450-1020F due to risk of temper embrittlement and loss of corrosion resistance

CHARACTERISTICS

Typical tensile & yield strength at RT

	52 HRC	46 HRC
Tensile Strength, psi	255,000	210,000
0.2% Yield Strength, psi	215,000	185,000

CORROSION RESISTANCE

ExELL 420 SMDQ resists rusting and staining due to humid service or storage conditions. Additionally, ExELL 420 SMDQ will resist typical corrosion by water, water vapor, weak organic acids and when molding corrosive plastics under normal conditions.

ExELL 420 SMDQ will exhibit maximum corrosion resistance when using a low temperature temper (480F) in heat treatment and when polished to a very fine finish.

TOOLMAKING

ExELL 420 SMDQ is manufactured to the highest premium quality requirements to provide molders with long life tools with low maintenance costs for the best molding economy. This controlled high quality also offers toolmaking very consistent steel properties. For additional information including specifics on machining, welding, grinding, polishing or EDM processing, please contact Ellwood Specialty Steel direct at **800-932-2188**.

